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THE CHANGING PATTERN OF CAPITAL EXPENDITURES
IN THE FEED-MILLING INDUSTRY



UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

Agriculture - Washington
AMS-54

Washington, D. C.
June 1955

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Acknowledgments

A major portion of this report is based on information obtained from a cooperative study conducted under contract with the agricultural experiment stations of Iowa, Oregon, and Tennessee. The major portion of this study was contained in Marketing Research Report No. 79, "Costs of Operating Selected Feed Mills," published by the U. S. Department of Agriculture in cooperation with the experiment stations of Iowa, Oregon, and Tennessee.

The authors also wish to acknowledge the assistance of members of the feed-milling industry who cooperated in the study and the American Feed Manufacturers' Association.

THE CHANGING PATTERN OF CAPITAL EXPENDITURES IN THE FEED-MILLING INDUSTRY

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Highlights

It required only 3 man-hours in feed-milling plants to produce a ton of feed in 1952 as contrasted to an average of 4 during 1947. This reduction appears to have resulted from a modernization of the feed-mill buildings and the introduction of labor-saving machinery. This increased efficiency in the use of labor rather than an increase in the number of plants and the number of employees appears to have been the means of increasing the volume of feed produced by the industry since 1947.

More than half of the Nation's feed-milling plants have been built or have completed major additions or remodeling since 1945. About two-thirds of them have purchased and installed new mixers and new grinders, and about three-fourths have installed new pelleting machines during this period.

Increases of 88 percent in the hourly earnings of production employees, 67 percent in freight rates, and 5 percent in electricity, as well as increases in many other cost items, have encouraged this effort by industry to increase operating efficiency. Capital expenditures in plant and equipment are high enough, however, to require careful consideration of management before new capital replacements are initiated.

Problem and Background

The milling and mixing of formula feeds has grown rapidly since 1927 when it was first reported as a separate industry by the Bureau of the Census. Early growth of the industry seems to have been characterized by a rapid expansion of the number of plants and the number of employees working in the industry. For example, the number of plants more than ^{1/}doubled between 1927 and 1935, and nearly tripled between 1935 and 1947. The total number of employees working in the industry increased from about 11,000 in 1927 to about 55,000 in 1947, and the number of production and related workers increased from less than 8,000 to more than 40,000. Output of the industry, as measured by the value of the products shipped, in 1947 was about seven times the 1927 level. When the value of the products shipped is deflated by an index of the price changes during the period, the result indicates that the physical output of the industry increased less between 1927 and 1947, than did the number of workers. Even considering the more complicated nature of the manufacturing process during recent

1/ 1947 Census of Manufactures, Grain Mill Products, MC20D and Mktg Res. Rept. No. 38, "The Mixed-Feeds Industry," William R. Askew and V. John Brensike.

times, and the probable reduction in hours worked per worker, industry averages appear to indicate that only a relatively small increase in output per man-hour had occurred in the feed-milling industry from 1927 to 1947.

The feed-milling industry has continued its rapid growth since 1947. Industry output, as measured by the tons of commercial feeds produced, was nearly a third higher in 1952 than it was in 1947. Contrary to the earlier growth, this recent growth does not appear to be explained by increases in the number of establishments and the number of employees. Estimates from the "Annual Survey of Manufactures" ^{2/} indicate that the size of the labor force engaged in production increased only 1 percent, while the average annual man-hours worked by each production worker decreased slightly. This indicates that if any material increase occurred in the number of establishments, the number of workers employed in each plant must have decreased. Even more important, however, is the fact that most of the 31 percent increase in tons produced appears to have come from an increase in the output per man-hour of the workers employed in feed-mixing establishments.

Estimates based on the "Annual Survey of Manufactures" ^{3/} indicate that while it required, on the average, about 4.2 man-hours to produce a ton of formula feed in 1947, it required only about 3.2 man-hours in 1952. This increased efficiency of labor used in the feed-milling industry is even more notable when the changes in final products are considered. Not only has the older tendency toward an ever increasing variety of finished and specialty feeds continued but the gradually expanding number of ingredients used has been increased during this period by the almost universal adoption of the use of minor ingredients, especially antibiotics and Vitamin B₁₂. All of these changes in the final product have tended to increase the number of starts and stops, and the use of minor ingredients in grams and milligrams per ton all have tended to increase the cost of production.

Analysis of operating costs and efforts to increase operating efficiency have undoubtedly been spurred on by the increases in the cost of most items required in the manufacturing of formula feeds. Since 1945, freight rates ^{4/} have increased about 67 percent, electricity costs ^{5/} 5 percent, and hourly wages of production workers employed in feed mills ^{6/} have increased 88 percent. Each of these items are important elements in the production of formula feeds. Labor costs, for

^{2/} 1952 Annual Survey of Manufactures, Bureau of the Census.

^{3/} Ibid.

^{4/} Freight rates for wheat. Marketing and Transportation Situation, 1954. Table 3.

^{5/} Bureau of Labor Statistics, Wholesale Price Index.

^{6/} Bureau of Labor Statistics, Wages and Hours Reports.

example, account for about 58 percent of the total costs of operating feed-mixing plants. 7/ Apparently the industry has been quite effective in increasing labor efficiency since the annual census of manufactures indicates only a 7 percent increase in the labor cost per ton of feed produced between 1947 and 1952. Hourly wages increased 41 percent during the same period.

One of the reasons for this increased efficiency in the use of labor is that capital is being used in the industry to install labor-saving equipment and redesign plants to yield a higher output per man-hour. While no complete information is available on capital outlays, a recent survey 8/ indicates that this development has been under way in the feed-milling industry. In the course of the survey, data were accumulated on the age of plants and the extent and timing of the most recent additions to plant and equipment. These data show the importance and direction of some of the major capital outlays. Some of the highlights relating to capital outlays are summarized in the following paragraphs.

Methodology 9/

This report is based on information obtained in the survey of the costs of operating feed-milling establishments. As a result, the survey was not designed specifically to analyze the shifting use of capital expenditures in the industry.

Thus the term, cooperating plants, as used in this report pertains to plants cooperating in the "cost" study and they may or may not have supplied data on the age of plant and the extent and timing of the most recent additions to plant and equipment. Also, since one of the primary purposes of the original study was to contrast operating costs in plants of different volumes, the sample drew larger plants at a greater sampling rate. In view of this fact, the present analysis will also be more accurate if the analysis is made on the basis of operating volume group averages rather than on the basis of an overall industry average.

The original survey covered the operation of 126 feed-mixing plants operating in the Middle Atlantic, Southern, Midwest, and Pacific regions of the United States. Sample and alternate plants were chosen at random within volume and geographic location strata. Between 22 and 35 plants cooperated in each of these regions and were quite evenly

7/ V. J. Brensike and W. R. Askew, Costs of Operating Selected Feed Mills, Mktg. Res. Rept. No. 79, Feb. 1955. USDA, Washington, D.C., pp.45.

8/ Ibid.

9/ Ibid.

distributed within each region over the operating volume area of from 1,000 to over 100,000 tons of feed mixed per year.

Proportion of Plants Modernizing

Plants and buildings

Capital expenditures on plants and equipment have continued at a high level since 1945. On the basis of the survey it is estimated that more than half of the existing feed-mill plants have been built or have completed major additions or remodeling during the period January 1, 1945, to July 1, 1953.

In the Middle Atlantic and Midwest areas, 58 percent of the cooperating firms indicated that they have built their plants or have completed major additions or major remodeling since 1945 (table 1). When those establishments which did not reply are excluded, this percentage increases to 68 percent. As is indicated in table 1, this rapid modernization of feed-mill plants seems to have occurred at about the same pace in feed mills of all sizes. These percentages are large enough in recent years to be worth noting even though it is recognized that a question of this type will nearly always result in heavier replies during recent periods.

Although fewer of the cooperating plant owners and operators supplied information on the age of plants and dates of later major capital outlays on plants and buildings in other areas of the country, over half of them also appear to have made major capital expenditures on plants

Table 1.--Date of plant construction, or last major remodeling or addition to plant, for feed mills in the Midwestern and Mid-Atlantic regions

Tons of feed mixed per year	Number of plants during each period					Total
	Prior to 1925	1925- 1934	1935- 1944	1945 July 1, 1953	No reply	
	No.	No.	No.	No.	No.	No.
Under 5,000	2	1	4	16	5	28
5,000 - 14,999	1	2	2	8	1	14
15,000 - 34,999	1	0	3	5	4	13
35,000 and over	0	2	0	9	2	13
Total	4	5	9	38	12	68

during this same period. ^{10/}

Feed mixers

All feed mills have one or more machines to mix the ingredients into the finished feed. Most mills, especially the small-and medium-size plants, use batch mixers. However, nearly half of the larger mills used the line or combination line-batch process. ^{11/} Each of these methods appears to have proved itself and has specific points in its favor for particular types of operations. From the standpoint of capital expenditure and efficiency of operation the date of installation is quite important, especially since many of the purchases signify expansion through an additional production line, or an attempt to attain increased efficiency from the new machine itself or through a slightly changed, ingredient-and product-flow design. Less man-hours may be required per ton produced, even when the purchase was made for an added production line, since the line itself may be relatively more efficient and the number of starts and stops may be eliminated or greatly reduced on one of the production lines.

Table 2.--Date of purchase and installation of last new feed mixing machines, United States

Tons of feed mixed per year	Number of plants during each period :						Total
	Prior to 1925	1925- 1934	1935- 1944	1945- July 1, 1953	No reply		
	No.	No.	No.	No.	No.	No.	
Under 5,000	0	1	11	25	6		43
5,000 - 14,999	0	3	9	19	4		35
15,000 - 34,999	0	0	7	12	2		21
35,000 and over	0	1	5	17	4		27
Total	0	5	32	73	16		126

^{10/} For the United States as a whole, two-thirds of the cooperating firms supplied data on the age of plants and recency of major plant expenditures. Sixty percent of those supplying data of this sort made major capital expenditures on their plants during the period Jan. 1, 1945, to July 1, 1953.

^{11/} V. J. Brensike and W. R. Askew, Op. Cit.

Two-thirds of the plants, for which information concerning the date of most recent purchase and installation was supplied, purchased and installed a feed mixer during the period from January 1, 1945, to July 1, 1953. Even when the plants not supplying this information are considered as having old mixers, 58 percent of all plants purchased and installed new mixers during the same period (table 2).

Grinders

Nearly two-thirds of the plants for which information was supplied on the most recent purchase of a new grinder, indicated they had purchased a new grinder during the period January 1, 1945, to July 1, 1953. Even if the "no reply" plants are considered as having old grinders, more than half of the plants purchased and installed new grinders during the same period (table 3).

Table 3.--Date of purchase and installation of last new grinding machine, United States

Tons of feed mixed per year	Number of plants during each period						Total
	Prior to 1925	1925- 1934	1935- 1944	1945 July 1, 1953	No reply		
	No.	No.	No.	No.	No.	No.	
Under 5,000	2	1	11	20	9		43
5,000 - 14,999	1	0	12	16	6		35
15,000 - 34,999	0	0	3	15	3		21
35,000 and over	0	0	6	14	7		27
Total	3	1	32	65	25		126

Grinders are found in all feed-mixing plants and are used to prepare ingredients, especially grain, for ultimate mixing. Hammer mills, attrition mills, crackers, etc., were found either singly or in combination. Hammer mills were the most common type. ^{12/} Again, however, each type has its advantages for a given operation and the recency of purchase and installation may be a better clue to improvements in efficiency either because the ingredient or product flow was also improved at the time the machine was installed, or because the new machine itself tends to be more efficient.

^{12/} V. J. Brensike and W. R. Askew, Op. Cit.

Pelleting machines

Pelleting of animal feeds is a relatively new service supplied by the feed-milling industry. Very little pelleting was performed prior to World War II. In view of this fact the purchase and installation of pelleting machines must be looked upon quite differently than the use of a new feed mixer or grinder. In the case of the latter machines, the new machines and possible new-flow patterns are merely doing the same job in a potentially more efficient manner. In the case of pelleting machines they are performing a new operation and supplying a new service for the feeders. As a result, their purchase and installation signals a tendency to increase the use of labor per ton of feed produced at the same time the capital expenditures increase.

Many plants, especially those with annual volumes of less than 5,000 tons, did not have pelleting machines in 1953 (table 4). Approximately two-thirds of the plants mixing 5,000 to 14,999 tons per year and nearly all the larger plants have pelleting machines. Excluding the plants not having pelleting machines, nearly three-fourths of the plants purchased machines during the period January 1, 1945, to July 1, 1953.

Table 4,--Date of purchase and installation of last new pelleting machine, United States

Tons of feed mixed per year	Number of plants during each period						Total
	Prior to 1925	1925-1934	1935-1944	1945 July 1, 1953	Have no pelleting machines	No reply	
	No.	No.	No.	No.	No.	No.	No.
Under 5,000	0	0	1	4	37	1	43
5,000 - 14,999	0	0	3	16	11	5	35
15,000 - 34,999	0	0	1	16	1	3	21
35,000 and over	0	0	2	19	2	4	27
Total	0	0	7	55	51	13	126

Capital Invested in Plant and Equipment

Capital investment in feed-mill plant and equipment is high even for companies and individuals who enter the industry on a small scale. Capital investment in plant and equipment ranged from \$24,000 to \$150,000 in those plants mixing less than 5,000 tons per year. The median plant in this volume group had an investment of \$48,000. Twenty-eight thousand dollars of this investment was in the plant itself and \$20,000 in machinery and equipment (table 5). Concerns mixing about

20,000 tons per year had an investment of about \$200,000, and those mixing 40,000 tons per year about \$300,000. Some of the largest companies had investments of over 2 million dollars in a single plant and its equipment.

It is interesting to note that the median capital investments for equipment in the volume groups mixing 15,000-24,999, 25,000-34,999, and 35,000-44,999 tons of feed per year amounted to between \$100,000 and \$110,000. This indicates a tendency toward less efficient use of machinery and equipment in the smaller volume plants. The analysis of operating costs ^{13/} indicates that this tendency carries through the entire range of operating volumes analyzed. Operating volume when expressed as a proportion of capacity tends to decrease as the operating volumes of the plants decrease. In this instance, it appears that either (1) a certain capital expenditure is required for equipment to produce about 20,000 tons per year and that this output can almost be doubled with the existing equipment, or (2) many plants have been constructed for a potential market of about 40,000 tons per year but have not as yet been able to achieve this objective.

Table 5.--Capital invested in plant and equipment by volume groups, U.S., 1953

Tons of feed mixed per year	:	No. of plants	:	Capital invested in feed mill & equipment			
				Feed mill plant and equipment		Plant ^{1/}	Equip- ment ^{1/}
				Range	Median plant		
		Number		1000 Dollars	1000 Dollars	1000 Dollars	1000 Dollars
Under 5,000	^{2/}	19		24-150	48	28	20
5,000 - 14,999	^{2/}	15		56-250	92	51	41
15,000 - 24,999	^{2/}	5		125-278	217	117	100
25,000 - 34,999	^{2/}	4		119-550	219	118	101
35,000 - 44,999		7		126-659	261	151	110
45,000 and over	^{3/}	12		441-2,243	843	514	329

^{1/} Based on group average proportions of total.

^{2/} One company rented plant or plant and equipment.

^{3/} A number of plants mixed over 100,000 tons of feed per year.

These capital investments in plant and equipment are based on the information on original investments as reported by 64 companies located in the Pacific, Midwestern, Southern, and Middle Atlantic areas of the United States. Replacement costs would, of course, be even higher. An analysis of the costs of operating feed-milling establishments indicates that when raw material costs and profits are excluded, depreciation accounts for about 9 percent of the total costs of operation in plants mixing less than 5,000 tons per year. 1/ The proportion of total costs represented by depreciation decreases gradually as the plant volume increases, but it still represents about 5.5 percent of the total costs in plants mixing 45,000 tons or more per year. This is a sizeable proportion of total costs and indicates the need for careful deliberation by management before deciding to initiate new capital investment. High repair costs and obsolescence must be kept in mind, as well as relative machine efficiencies, relationship of labor and depreciation costs, and feeder demand for pellets, bulk delivery, and other new or potential services.

1/ Ibid.

